

Mar 80

Sonalert® electronic audible signals

its uses are limited only
by your
imagination





Mallory Sonalet® signals produce an audible tone by electronic means when voltage is applied. Voltage from 1V to 250V may be used depending upon the model.

Electrical power is converted to sound by means of a semiconductor oscillator which drives a piezoceramic element substantially at its resonant frequency, resulting in efficient power conversion.

Sonalet signals may be powered by many electrical sources ranging from single cell batteries to industrial power lines. Little electrical power is required making them ideally suitable for portable battery operated equipment. This low power feature allows the Sonalet signal to be turned on or off with a low power transistor, SCR, or integrated circuit. Completely solid state with no moving parts, no arcing, and no mechanical wear, the Mallory Sonalet signals should give you many years of trouble-free service.

Audio characteristics

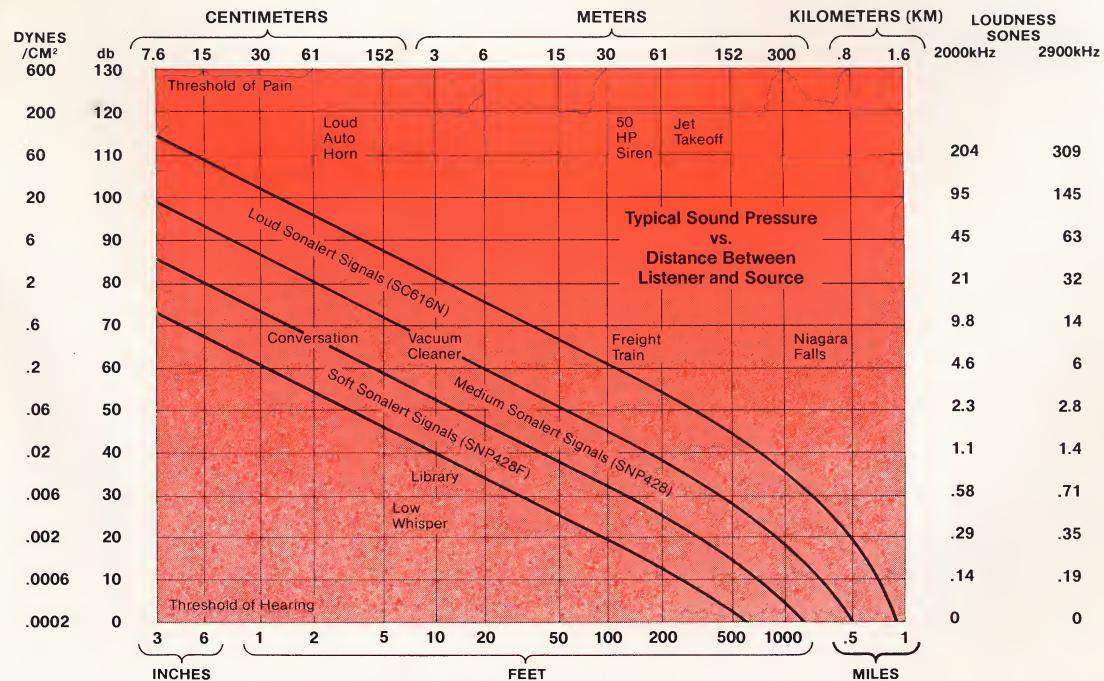
Sound Pressure

Sonalet signals generate air pressure waves which travel through the air to the listener's ear where they produce a sensation of sound. The amount of pressure needed to produce sound depends upon the loudness and the frequency ratings of the Sonalet signal. Sonalet signal frequencies have been selected for maximum loudness with minimum amount of sound pressure.

Measurements of sound air pressure are expressed as a ratio compared to a pressure of .0002 dynes per square centimeter. This is the smallest sound pressure heard by the average person. The largest pressure that can be heard before pain is felt is about 3 million times higher. For measurement convenience, this wide pressure range is converted to a logarithmic ratio and expressed in decibels (db) according to the formula:

$$db = 20 \log \frac{\text{measured pressure}}{.0002 \text{ dynes/cm}^2}$$

The threshold of hearing has a ratio of 1:1, or a db of 0. The threshold of pain has a ratio of 3 million:1 or a db of 130.



Sound Pressure Change with Distance

When the sound pressure leaves the Sonalet signal, it radiates in all directions and is about 2 or 3 db greater in the direction the open grill is facing. As the sound pressure travels toward the listener it covers a greater area with a corresponding reduction in pressure at any one point until it is below the threshold of hearing.

For distances shorter than 50 meters, sound pressure drops 6 db each time the distance traveled is doubled. Variations as much as \pm 8 db may occur inside a room or around large objects such as buildings due to echo cancellation and reinforcement effects.

For distances longer than 2KM, air friction reduces sound air pressure about 10 db/KM @ 1500 Hz, and 20 db/KM @ 3000 Hz. Of course, the reduction in sound pressure between stationary points also depends upon wind direction and turbulence.

Perhaps the loudest known sound was caused by the eruption of Mt. Krakatua in 1883 which was estimated at 170 db at 3 miles.

Sound Pressure Specifications

Since sound pressure decreases as it travels from the Sonalert® signal, standard measurements must be made at a standard distance. Mallory standard measurements are made at a distance of 2 feet in an anechoic chamber; or 10 feet above the ground in an open area with no wind. Sound pressure specifications for all Sonalert signal models are shown on pages 3, 4 and 7.

Loudness

The loudness of sound heard from a Sonalert signal depends upon, among other things, the hearing sensitivity of the listener, the frequency of the sound, the distance to the listener, the density and humidity of

the air, the design of the Sonalert signal and the voltage applied. A measurement of loudness is the sone, and it may be used to judge the relative loudness between sounds. For example, a sound with a loudness of 4 sones will sound about 4 times louder than a sound of 1 sone. Because loudness at the listener's location is dependent upon the environment, it is not specified for Sonalert signals.

Frequency

Each Sonalert signal model has its own frequency (tone) which cannot be changed. Models are available to provide frequencies from 1900 to 4500 Hz. For equal sound pressure 1900 Hz Sonalert signals sound softer and more pleasant than 2900 Hz and 4500 Hz Sonalert signals.

Audio and electrical specifications

Part and Model Number	Loudness Category	Mounting Method	Case Style	Frequency ±500Hz	Minimum Sound Pressure dB (A) at Two Feet		Operating Voltage *AC/DC Non-polar All Others DC Only		Typical Operating Current MA	
					At Min. V	At Max. V	Min.	Max.	At Min. V	At Max. V
SC110N	LOUD	PANEL	D	2900	80	95	*30	120	8	28
SC616N	LOUD	PANEL	C	2900	80	95	6	16	4	16
SC616NL	LOUD	PANEL	C-3	2900	80	95	6	16	4	16
SC628AN	LOUD	PANEL	D	2900	80	95	* 6	28	8	28
SC648AN	LOUD	PANEL	D	2900	80	95	*10	48	8	28
SBM2	MEDIUM	PRINTED BOARD	F	2900	55	68	1	5	2	12
SBM428	MEDIUM	PRINTED BOARD	F	2900	64	78	4	28	2	14
SNP2	MEDIUM	SNAP IN PANEL	B	2900	55	68	1	5	2	12
SNP428	MEDIUM	SNAP IN PANEL	B	2900	64	78	4	28	2	14
SC110	MEDIUM	PANEL	D	2900	68	80	*30	120	4	16
SC110D	MEDIUM	PANEL	D	1900	60	75	*30	120	4	16
SC110H	MEDIUM	PANEL	D	4500	68	80	*30	120	4	16
SC110M†	MEDIUM	PANEL	D	2900	68	80	*30	120	4	16
SC250	MEDIUM	PANEL	D	2900	68	80	*60	250	4	16
SC250D	MEDIUM	PANEL	D	1900	60	75	*60	250	4	16
SC250H	MEDIUM	PANEL	D	4500	68	80	*60	250	4	16
SC628	MEDIUM	PANEL	C	2900	64	80	4	28	3	14
SC628A	MEDIUM	PANEL	D	2900	68	80	* 6	28	4	16
SC628AD	MEDIUM	PANEL	D	1900	60	75	* 6	28	4	16
SC628AH	MEDIUM	PANEL	D	4500	68	80	* 6	28	4	16
SC628D	MEDIUM	PANEL	C	1900	60	75	6	28	3	14
SC628H	MEDIUM	PANEL	C	4500	68	80	6	28	3	14
SC628L	MEDIUM	PANEL	C-3	2900	68	80	6	28	3	14
SC628M†	MEDIUM	PANEL	C	2900	68	80	6	28	3	14
SC628MD†	MEDIUM	PANEL	C	1900	60	75	6	28	3	14
SC648	MEDIUM	PANEL	C	2900	68	80	10	48	3	14
SC648A	MEDIUM	PANEL	C	2900	68	80	*10	48	4	16
SC648AD	MEDIUM	PANEL	D	1900	60	75	*10	48	4	16
SC648AH	MEDIUM	PANEL	D	4500	68	80	*10	48	4	16
SC648D	MEDIUM	PANEL	C	1900	60	75	10	48	3	14
SC648H	MEDIUM	PANEL	C	4500	68	80	10	48	3	14
SC1.5	SOFT	PRINTED BOARD	A	3500	60 @ 1.5 V		1	4	4 @ 15 V	
SC6	SOFT	PRINTED BOARD	A	3500	70 @ 6 V		4	8	12 @ 6 V	
SC12	SOFT	PRINTED BOARD	A	3500	70 @ 12 V		8	15	14 @ 12 V	
SC18	SOFT	PRINTED BOARD	A	3500	70 @ 18 V		14	22	16 @ 18 V	
SC24	SOFT	PRINTED BOARD	A	3500	70 @ 24 V		20	30	16 @ 24 V	
SNP428F	SOFT	SNAP IN PANEL	B	2900	55	70	4	28	0.5	3
SC110E	SOFT	PANEL	D	1900	55	65	*30	120	3	14
SC110F	SOFT	PANEL	D	2900	55	70	*30	120	1	4
SC250E	SOFT	PANEL	D	1900	55	65	*60	250	3	14
SC250F	SOFT	PANEL	D	2900	55	70	*60	250	1	4
SC628AE	SOFT	PANEL	D	1900	55	65	* 6	28	3	14
SC628AF	SOFT	PANEL	D	2900	55	70	* 6	28	1	4
SC628E	SOFT	PANEL	C	1900	55	68	6	28	3	8
SC628F	SOFT	PANEL	C	2900	55	70	6	28	0.5	3

† Military Version

Audio and electrical specifications

Intermittent Tones					Minimum Sound Pressure dB (A) at Two Feet		Operating Voltage *AC/DC Non-polar All Others DC Only		Typical Operating Current MA		
Part and Model Number	Loudness Category	Mounting Method	Case Style	Frequency ±500Hz	At Min. V	At Max. V	Min.	Max.	At Min. V	At Max. V	
Fast Pulse Turns on and off at 2 to 9 pulses per second depending upon voltage at 50% duty cycle.											
Slow Pulse Turns on and off at .5 to 1.5 pulses per second depending upon voltage at 50% duty cycle.											
SC110NP	SC110NJ	LOUD	PANEL	D	2900	80	95	*30	120	8	28
SC616NP	SC616NJ	LOUD	PANEL	C	2900	80	95	6	16	4	16
SC628ANP	SC628ANJ	LOUD	PANEL	D	2900	80	95	* 6	28	8	28
SC648ANP	SC648ANJ	LOUD	PANEL	D	2900	80	95	*10	48	8	28
SBM616P	SBM616J	MEDIUM	PRINTED BOARD	F	2900	68	78	6	16	1	4
SC110DP	SC110DJ	MEDIUM	PANEL	E	1900	60	75	*30	120	4	16
SC110HP	SC110HJ	MEDIUM	PANEL	E	4500	68	80	*30	120	4	16
SC110P	SC110J	MEDIUM	PANEL	E	2900	68	80	*30	120	4	16
SC250DP	SC250DJ	MEDIUM	PANEL	E	1900	60	75	*60	250	4	16
SC250HP	SC250HJ	MEDIUM	PANEL	E	4500	68	80	*60	250	4	16
SC250P	SC250J	MEDIUM	PANEL	E	2900	68	80	*60	250	4	16
SC616P	SC616J	MEDIUM	PANEL	C-1	2900	68	78	6	16	1	4
SC616P-1	SC616J-1	MEDIUM	PANEL	C-2	2900	68	78	6	16	1	4
SC628ADP	SC628ADJ	MEDIUM	PANEL	E	1900	60	75	* 6	28	4	16
SC628AHP	SC628AHJ	MEDIUM	PANEL	E	4500	68	80	* 6	28	4	16
SC628AP	SC628AJ	MEDIUM	PANEL	E	2900	68	80	* 6	28	4	16
SC628DP	SC628DJ	MEDIUM	PANEL	D	1900	60	75	6	28	3	14
SC628HP	SC628HJ	MEDIUM	PANEL	D	4500	68	80	6	28	3	14
SC628MP+		MEDIUM	PANEL	D	2900	68	80	6	28	3	14
SC628P	SC628J	MEDIUM	PANEL	D	2900	68	80	6	28	3	14
SC648ADP	SC648ADJ	MEDIUM	PANEL	E	1900	60	75	*10	48	4	16
SC648AP	SC648AJ	MEDIUM	PANEL	E	2900	68	80	*10	48	4	16
SC110EP	SC110EJ	SOFT	PANEL	E	1900	55	68	*30	120	3	14
SC110FP	SC110FJ	SOFT	PANEL	E	2900	55	70	*30	120	4	16
SC250EP	SC250EJ	SOFT	PANEL	E	1900	55	68	*60	250	3	14
SC250FP	SC250FJ	SOFT	PANEL	E	2900	55	70	*60	250	4	16
SC628AEP	SC628AEJ	SOFT	PANEL	E	1900	55	68	* 6	28	3	14
SC628AFF	SC628AFJ	SOFT	PANEL	E	2900	55	70	* 6	28	4	16
SC628EP	SC628EJ	SOFT	PANEL	D	1900	55	68	6	28	3	8
SC628FP	SC628FJ	SOFT	PANEL	D	2900	55	70	6	28	3	14
Short Pulse Turns on and off at .5 to 1.5 pulses per second depending upon voltage at 10% duty cycle.											
SC110K	MEDIUM	PANEL	E	2900	68	80	*30	120	4	16	
SC628K	MEDIUM	PANEL	D	2900	68	80	6	28	3	14	
SC110FK	SOFT	PANEL	E	2900	55	70	*30	120	4	16	
SC628FK	SOFT	PANEL	D	2900	55	70	6	28	3	14	
Combined continuous or pulsing sound in one package. When power terminals are connected, third terminal may be switched to common (-) to select a continuous sound or switched to positive (+) to select a pulsing sound. Switching current is less than .15 milliamp.											
Continuous Fast Pulse	Continuous Slow Pulse										
SBM616PC	SBM616JC	MEDIUM	PRINTED BOARD	F	2900	68	78	6	16	2	10
Fast Warble Slow Warble Produces two tones alternately when used with additional continuous tone unit.											
SC628W (USE WITH SC628D OR SC628H)	SC628JW	MEDIUM	PANEL	D-1	2900	68	80	6	28	3	16
SC628FW (USE WITH SC628E)	SC628FJW	SOFT	PANEL	D-1	2900	55	70	6	28	3	14
Chime Tone A pleasant sound which chimes every one or two seconds as long as voltage is applied.											
SC616CP	MEDIUM	PANEL	D	2900	68	80	6	16	3	8	
Chirp A unique sound which pulses at 20-60 pulses per second rate.											
SC110Q (AC ONLY)	MEDIUM	PANEL	C	2900	68	80	30	120	3	10	
SC616Q	MEDIUM	PANEL	C-1	2900	68	78	6	16	1	4	

† Military Version

In addition to the standard line of Sonalert® signals listed in this bulletin, custom audio signals are designed by our staff of Audio Engineers to meet special requirements.

Underwriters laboratories

The following models are listed as recognized components—audible signal appliances. Guide Number UCST2, Yellow Card Number S1290.

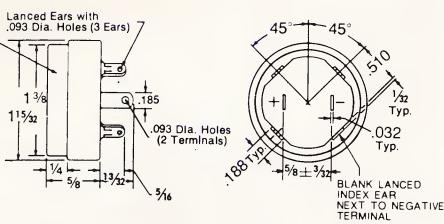
SNP428 SC628 SC648 SC628P SC110 SC110P

Case styles

OUTLINE DIMENSIONS FRACTIONS $\pm \frac{1}{32}$ DECIMALS $\pm .01$



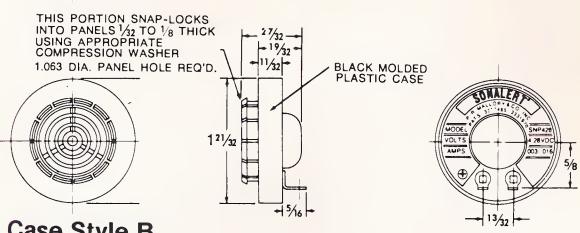
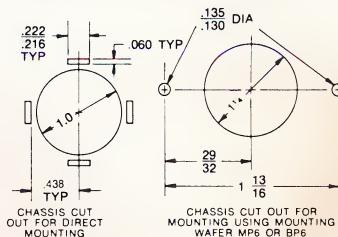
Case Style A



Terminals—.032 steel, tin plated with .093 dia. wire hole, will accept standard 3/16" quick disconnect.



BP6 BAKELITE MOUNTING WAFER



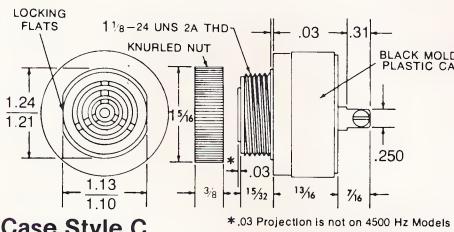
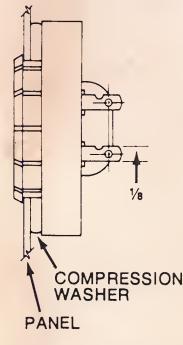
Case Style B

Terminals—.016 brass, hot tin finish with .076 wire hole. Terminal will accept standard 1/8" quick disconnect.

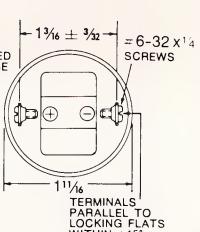
Mounting—Four lanced twist mount ears per EIA std. RS395 are provided for mounting. Terminals are electrically isolated from case and mounting ears. Also may be mounted using mounting wafer number MP6 for uninsulated mounting or mounting wafer number BP6 to insulate case from chassis.

Mounting—Panel hole $1.063 \pm .005$ diameter should be punched from the back side so that locking fingers enter on the slightly rounded edge of the hole. Assemble proper compression washer and press into panel hole until locking fingers snap over hole edge. Installation pressure should be applied only at the circumference of the device.

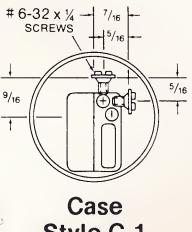
PANEL THICKNESS	COMPRESSION WASHER NO.
11-12 GA. (.125-.109)	PW1
13-17 GA. (.093-.056)	PW2
18-22 GA. (.050-.031)	PW3



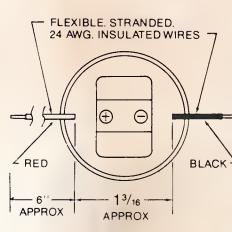
Case Style C



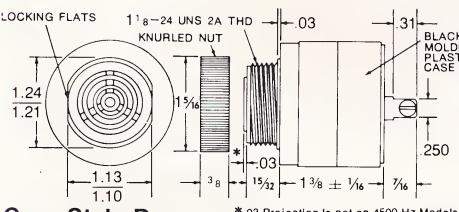
Case Style C-1



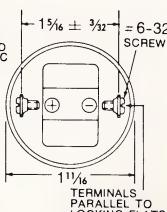
Case Style C-2



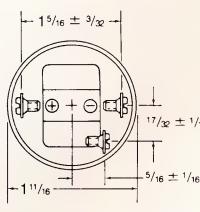
Case Style C-3



Case Style D



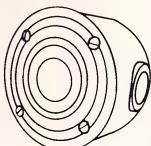
Case Style D-1



Case Style D-2

Case Style E—Outline dimensions are the same as case style D except length dimension of $1\frac{3}{8} \pm 1\frac{1}{16}$ is changed to $1\frac{15}{64} \pm 3/32$.

Electrical Mounting Box—Part Number SCMB
Used to mount Sonalert® signal case styles C and D on standard 3/4 inch electrical conduit. 3-1/2 inch diameter, 2 inch deep ABS plastic.



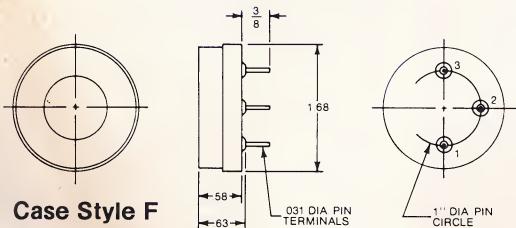
Case Style F—See next page.

Terminals—.032 brass, tin plated, tapped for #6-32 screw. Two #6-32 cadmium or zinc plated steel screws included. Will accept standard 1/4" quick disconnect.

Mounting—Remove black plastic nut and insert threaded front through 1.25" hole punched in panel. If orientation is needed, note locking flats on drawing. Screw nut back on. Do not overtighten. To substitute natural finished aluminum nut add C to catalog number. To substitute black anodized aluminum nut add B to catalog number. Example: — SC628B.

Case styles

OUTLINE DIMENSIONS FRACTIONS $\pm \frac{1}{32}$ DECIMALS $\pm .01$



Case Style F

Mounting—Insert into printed circuit board and hand or machine solder. For recommended fluxing, soldering, and cleaning procedures, send for Mallory Audio Signal Engineering Bulletin 778.

Terminals—.031 dia. soldercoated copperclad steel.

Electrical Connections—SBM2, SBM428, SBM616P, SBM616J—When pin 1 is connected to + voltage and pin 3 is connected to common (-), unit will sound. Pin 2 is for mechanical support only and is not connected internally.

SBM616PC, SBM616JC—When pin 1 is connected to + voltage, and pin 3 is connected to common (-), and the voltage on pin 2 is within 1.25V of pin 1 or higher, the unit will sound a pulsing tone. When the voltage on pin 2 is within .9V of pin 3 or lower the unit will sound a continuous tone. The maximum voltage which may be applied to pin 2 before damage may occur is ± 16 V referenced to pin 3. Pin 2 input impedance is 110K ohm.

Environmental specifications

Surge voltage

15% over maximum rated voltage applied for less than one minute.

Reverse voltage — DC models

Maximum reverse polarity equal to rated voltage for one minute. Some models may sound softly when subjected to reversed polarity voltage.

Life specification

Continuous—100 hours continuous operation at 65°C with maximum rated voltage applied.

Intermittent—A duty cycle of 1 minute on, 5 minutes off, a minimum of 5000 times at room temperature and maximum rated voltage applied.

Life expectancy

5 years under normal operating conditions.

Storage temperature

-40°C to +85°C.

Operating temperature

-30°C to +65°C.

Humidity

The Sonalert® signal should operate after having been subjected to 95% Relative Humidity at +40°C continuously for 100 hours. After removal from test, the unit should be allowed to dry a minimum of 4 hours at room temperature before operation. Units should deliver original output characteristics.

Vibration

The Sonalert signal should be mounted in the standard manner on a mounting panel. The specimens should be subjected to a harmonic motion having an amplitude of 0.03 inch (0.06 inch maximum total excursion). The frequency should be varied uniformly between a limit of 10 and 55 Hertz. The entire frequency range from 10 to 55 Hertz and return to 10 Hertz should be traversed in approximately one minute. Motion should be applied for two hours in each of 3 mutually perpendicular planes (total 6 hours). This test should be conducted while the Sonalert signal is not operating. After completion of test, Sonalert signals should meet specifications.

Salt spray

The Sonalert signal should meet specified operating conditions after completing 96 hours in an atomized salt spray while not operating. The spray should consist of a 5% salt solution atomized by a forced air supply. The solution should be sprayed through a nozzle into a chamber maintained at 35°C. After salt spray, the unit should be removed and washed in running water not warmer than 40°C. A soft hairbrush or plastic bristle brush should be used, lightly brushing to remove salt deposits from the unit. The cleaned Sonalert signals should be placed on absorbent material with the nose cone pointed downward and allowed to dry at room temperature for 24 hours prior to use.

Terminal strength

5 pounds, applied axially for a period of 5 minutes. This is considered a destructive test.



Sonalert® signals for military applications

For applications requiring operation over extended temperature ranges, or in extreme environmental conditions, military models are recommended. These special units use MIL approved components if available. Internal parts are treated with a moisture deterrent protective coating. Mounting nut is anodized aluminum. Terminals are tin plated brass with nickel plated 6-32 screws. All units are marked with Mallory name, part number, polarity and date code per MIL-STD-1285. Marking is permanently preserved by a layer of clear epoxy. Customer part number may be included on label if desired. A certificate of compliance to Mallory specifications will be supplied if requested.

Typical current is 3 MA at min voltage. 14 MA at max voltage. Minimum sound level (dBA at two ft) is 68 at

min voltage, 80 at max voltage. Fast Pulse models turn on and off at 2 to 9 Hz depending upon voltage at 50% duty cycle. Fast Warble models are to be used with SC628M, SC628MH, or SC628MD to produce two tones alternately.

Black plastic case and black anodized aluminum mounting nut is standard. To specify olive drab case and mounting nut, add G to part number. Example: SC628MAHG. To specify black case and clear anodized mounting nut add C to part number. Example: SC628MAHC.

Environmental specifications

Test	MIL-STD-202 method	Test condition
Thermal shock	107	A
Humidity	103	B
Salt spray	101	A
Shock	213	H
Vibration	201	None
Terminal strength	211	A (5 lbs)

Life specifications: 250 hours continuous operation at 85°C and maximum rated voltage applied. 5000 cycles one minute on, 5 minutes off at 27°C and maximum rated voltage applied.

Life expectancy: 5 years under normal operating conditions.

Operating temperature: -40°C to +85°C

Storage temperature: -65°C to +85°C

Altitude change: 10,000 feet per minute max

Quality Specifications

Operating — 100% tests of sound level and frequency at 85°C, 27°C and -40°C. Data at 27°C is supplied with parts.

Environmental — MIL Std. 105D Level II single normal inspection .65 AQL.

Operating specifications

Part & Model Number	Frequency ±500 Hz	Operating voltage		Case style code (page 5)
		min	max	
Continuous Tone				
*SC628M	2900	6	28	C
SC628MD	1900	6	28	C
SC628MH	4500	6	28	C
SC648M	2900	10	48	C
SC648MD	1900	10	48	C
SC648MH	4500	10	48	C
Fast Pulse				
*SC628MP	2900	6	28	D
SC628MHP	4500	6	28	D
Fast Warble				
SC628MW	2900	6	28	D-1
Continuous Tone				
AC/DC Non Polar				
SC628MA	2900	6	28	D
SC628MAH	4500	6	28	D
SC648MA	2900	10	48	D
SC648MAH	4500	10	48	D
*SC110M	2900	30	120	D
SC110MH	4500	30	120	D
SC250M	2900	60	250	D

*Part No's. are stock items



Applications

Sonalert signals are presently being used in a wide variety of applications, including the following:

- Aircraft
- Airport metal detectors
- Automobiles
- Bank machines
- Bathtub controls
- Busses
- Cash registers
- Computer terminals
- Computer mainframes
- Data transmission equipment
- Electronic instruments
- Farm instruments
- Farm vehicles
- Ferry boats
- Fire alarms
- Fork lift trucks
- Games for the blind
- Golf cart horns
- Helicopters
- Hospital call systems
- Hotel call systems
- Industrial radios
- Intrusion alarms
- Medical instruments
- Military radar systems
- Military radios
- Mini computers
- Motorcycle turn signals
- Ocean liners
- Police radar detectors
- Production machinery
- Railroad cars
- Recreation boats
- Refrigerator temperature alarms
- Restaurant cooking equipment
- Restaurant dishwashing equipment
- School signal systems
- Spacecraft
- Submarines
- Telegraph keyboards
- Telephone handsets
- Telephone switchboards
- Time clocks
- Traffic signals
- Trucks
- X-Ray machines

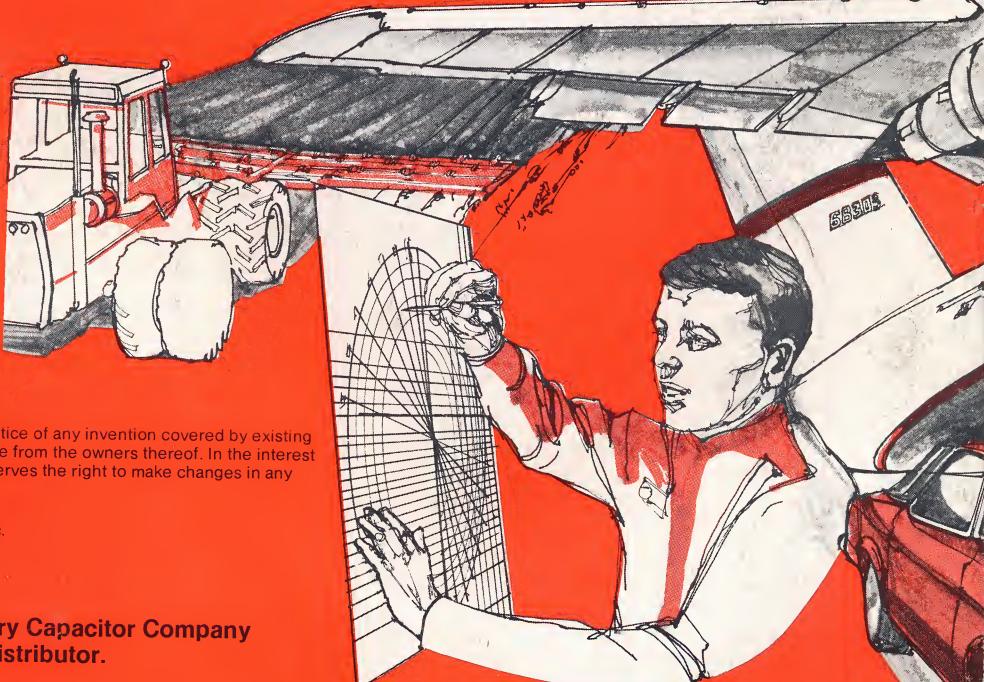
Other applications are limited only by your imagination. Give us a hearing.

Warranty

Mallory warrants that the Sonalert* signal apparatus will be as described herein. If, within one (1) year from date of manufacture or 100 operating hours, whichever occurs first, this apparatus, not having been subjected to abnormal use or unauthorized repairs, not exposed to abnormal environment is shown to Mallory's satisfaction to have failed through faulty workmanship or materials, its repair or replacement will be effected free of charge, provided return is made prepaid to P.R. Mallory & Co. Inc. or its designated representative. THERE ARE NO WARRANTIES WHICH EXTEND BEYOND THE DESCRIPTION HEREIN, EITHER AS TO MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. MALLORY'S SOLE AND EXCLUSIVE OBLIGATION IS TO REPAIR OR REPLACE THE APPARATUS THAT HAS FAILED THROUGH FAULTY WORKMANSHIP OR MATERIALS. MALLORY ASSUMES NO LIABILITY FOR DAMAGE TO PROPERTY OR CONSEQUENTIAL DAMAGES FOR LOSS OF GOOD WILL, OR PRODUCTION, OR INCOME, WHICH RESULT FROM USE OR MISUSE OF THE APPARATUS BY A PURCHASER OR OTHERS.

Nothing herein is to be construed as advising or authorizing practice of any invention covered by existing patents owned by P.R. Mallory & Co. Inc. or others without license from the owners thereof. In the interest of improved design and performance, P.R. Mallory & Co. Inc. reserves the right to make changes in any specification, data, or material contained herein.

* SONALERT is a Registered Trademark of P.R. Mallory & Co. Inc.



For pricing and ordering contact your Mallory Capacitor Company sales representative or your local Mallory Distributor.

MALLORY

MALLORY CAPACITOR COMPANY

a division of P.R. MALLORY & CO. INC.

4760 Kentucky Avenue, Indianapolis, Indiana 46241; Telephone: 317-856-3731/TWX: 810-260-3940